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*Number 8*

# Lubrication

A Technical Publication Devoted to  
the Selection and Use of Lubricants

## THIS ISSUE

Driving Chains  
and Their Lubrication

Lubrication of Road  
Building Machinery



PUBLISHED MONTHLY BY  
**THE TEXAS COMPANY, U.S.A.**  
TEXACO PETROLEUM PRODUCTS

# DRIVING CHAIN LUBRICATION

AS THERE is so wide a divergence in types and uses of Driving Chains, it is only natural that there should be a proportionate diversity in the characteristics of the lubricants best suited for various types of Chain Drives.

This is so. Hence, an operator cannot hope for complete success when he merely asks for "some chain lubricant", or, "some dope for that chain."

He must take the working conditions into consideration. Or, better yet, leave the selection of the lubricant to an organization of engineers who

have studied it from every angle and abide by their recommendations, made from actual experience.

With this thought in mind we offer for the most suitable Chain Drive lubricants, the following suggestions compiled by Texaco Lubrication Engineers.

These recommendations will cover practically every installation. But if exceptionally unusual conditions have made it especially difficult to lubricate a Chain Drive in the past, write us fully with particulars and a rough sketch, if practicable, and we feel certain that we can solve the problem.

## RECOMMENDATIONS FOR DRIVING CHAIN LUBRICATION

### Malleable Iron and Stamped Steel Chains

TEXACO CRATER COMPOUND No. 1 or 2 according to type and service.

### Roller and Block Type Chains

TEXACO CRATER COMPOUND No. 1 where clearances and operating conditions warrant a semi-solid lubricant.

TEXACO THUBAN COMPOUND

where clearances are lower, and operating conditions make it advisable to use a more fluid lubricant.

### Silent Chains

Chain submerged and bath lubricated: TEXACO ALTAIR OIL

Chain encased but not submerged in oil, or where chains are exposed: TEXACO THUBAN COMPOUNDS

### In Special Instances

TEXACO LIQUID GREASE "D" or TEXACO PINNACLE MINERAL CYLINDER OIL.

NOTE: When silent chains are installed in automobile engines the motor lubricant serves to lubricate them.

These lubricants can be obtained from the many Texaco Sales Stations which dot the map. You will probably know the Texaco station nearest to you. If you don't, drop us a line and we shall let you know where you can obtain proper lubricants and lubricating service promptly.



THE TEXAS COMPANY, U. S. A.

*Texaco Petroleum Products*

Dept. H. 17 Battery Place, New York City



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## Driving Chains and Their Lubrication

CHAIN drive in some form or other is a factor in many phases of industry today.

As a result, chain lubrication is of decided importance. It is possible that every man who operates an automobile, according to the make of his car, may have to deal with chain drive in some respect, whether he knows it or not. From the heavy driving device commonly installed on certain trucks to the light, flexible silent chains which so many automobile builders use to transmit power from the crank shaft to the timing gears, etc., is a wide step. Just because you don't drive a truck and can not see (or hear) your chain mechanism, if one is installed, is no reason to assume that you are not interested in chain lubrication. You are, for, without chains and proper chain lubrication your car might possibly rest peacefully in the garage.

Inasmuch as we should all be interested in chains, we should of course be interested in chain construction. There are numerous forms of driving chains on the market today. The heavy steel sprocket roller chains which are breaking records for durability and production in the oil fields, or the light silent mechanisms which are used on small motor drives in the textile industry, are typical examples of the wide adaptability of the chain drive. Between these limitations we find a variety of other

designs of driving chains such as the pintle chain, the stamped malleable iron or steel bar chain, the detachable link-belt, and the various other types of chains used so extensively in the manufacture of conveying devices, etc. Conveyor chains, however, are often relatively difficult to lubricate.

### Types of Chains

Chain drive can be grouped under three distinct classifications according to the working conditions and degree of effective lubrication to which they are subject. These are:

1. The less costly malleable iron or steel stamped chains, used for rough service, running on cast tooth sprockets and usually operated dry, or lubricated by hand with the cheapest chain lubricant obtainable.

2. The roller and block type chains which are built for durability, and designed for service with sprockets, the teeth of which are accurately cut to conform to the links, and

3. The silent chains which are intended to supersede belts and gearing in the transmission of power, where positive and noiseless drive is necessary and where the distance between shafts is too great for practical gear driving and too short for belting efficiently. They are the most perfectly built chain mechanisms on the market and have proven their value by their power

saving ability, silent operation, and economical service where properly installed and lubricated.

#### *Detachable and Pintle Chains, etc.*

The detachable chain is probably the cheapest and simplest type in use today. As usually built it consists of stamped malleable iron or steel links capable of engagement with each other as shown in Fig. 1. When the chain is

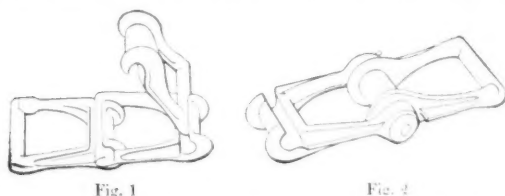


Fig. 1

Fig. 2

*Courtesy of Simmons-Boardman Publishing Co.*

Fig. 1.—Details of a detachable chain.  
Fig. 2.—Detachable chain equipped with a coupler link and removable pin.

straightened out it is impossible for the links to disengage; by folding or bending, however, the bar can readily be slipped out from the hook through the aperture in the latter. As a rule detachable chains are used for elevator and conveyor service or for sprocket drives where a relatively cheap, durable chain is necessary. Due to the usual high clearances in bearings, chains of this nature are prone to wear rapidly in the presence of dirt, dust and other abrasive materials. Wear of this nature increases the pitch and frequently causes the chain links to fit unevenly over the sprockets. To counteract this wear, the use of a highly adhesive, semi-fluid straight mineral chain lubricant has been found to be very beneficial where lubrication is possible.

When detachable chains are to be used on sprockets a certain amount of slack will be met with. This can be corrected by using a coupler link built for pin connection as shown in Fig. 2. Links of this type can be readily inserted or removed as necessary.

The pintle chain, as shown in Figs. 3 and 4,

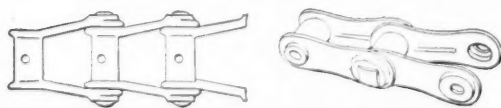


Fig. 3

Fig. 4

*Courtesy of Simmons-Boardman Publishing Co.*

Fig. 3.—Simple Pintle Type Chain details.

Fig. 4.—Type of interlocking Pintle Chain fitted with a dirt-proof joint.

extends the usage of the malleable iron link to a pin connected device, and is a valuable substitute for the detachable chain where abrasive materials are to be encountered. The connecting pins are either riveted over on the ends or held rigidly in the links by nuts or cotter pins. Pintle chains are stronger than detachable chains by virtue of their construction and can therefore be used on somewhat heavier service. Variations of this type of chain include the saw mill pintle chain and the interlocking pintle chain. This latter is built with self-contained link connections which are effective in preventing the entry of dirt, dust or other abrasive matter. On the other hand there is sufficient end clearance to permit of ready entry of a comparatively heavy gear lubricant. Once such a lubricant has penetrated to the interior wearing surfaces this clearance serves to retain it and prevent dripping or throwing during operation. Where either pintle or detachable chains are used as drags in conveyor work, such as in the handling of sawdust, ashes or other fine materials, naturally lubrication is impossible.

#### *Roller Chains*

Roller chains occupy a distinct field as a means of power transmission. Essentially they

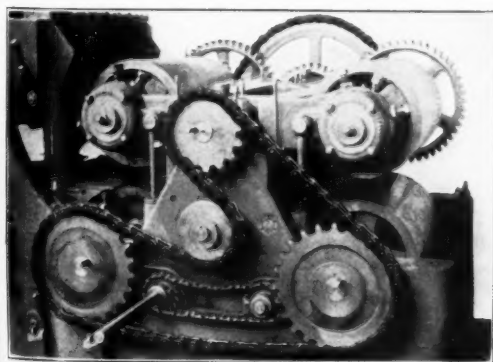


*Courtesy of Diamond Chain and Mfg. Co.*

Fig. 5.—Roller type of chain showing manner of joint attachment and details of pins and bushings.

are used where a relatively inexpensive, heavy duty, durable chain is required, and where noise is not a serious objection. In fact, roller chains in general are applicable to a grade of service wherein a silent chain would be an expensive refinement, and yet where a cheaper rough chain of the pintle type could not be used. Roller type chains in reality extend the application of the efficiencies of a chain drive system to classes of work where normally the usual economies of modern industrial power transmission are lost sight of.

Due to the high speeds that may be required, roller chain bearing surfaces are machined to a smooth finish in order to enable effective lubrication, and insure against abnormal wear. Sprocket teeth are also constructed in the same manner. The extreme service under which certain tractor and automobile truck chains operate is an excellent example to us of what an average roller chain must be capable of enduring. As well, it is an ideal example of how the subject of chain lubrication enters into the question of chain operation. We have but to note the condition of the driving chains on the next truck we meet to realize this. In all probability they will appear to be coated with mud, or a caked mixture of dust and lubricant. This is but a surface indication, however. If a proper chain lubricant has been used, and carefully applied to the chains, in all probability the interior wearing surfaces of the links and rollers, etc., will be practically free from abrasive matter and coated with an adhesive, protecting film of the lubricant. In other words this latter not only serves as a lubricant but also as a protective agent.



*Courtesy of Diamond Chain and Mfg. Co.*

Fig. 6.—Installation of Roller Chains on a wood-working machine.

## Silent Chain Drives

Silent chains include all such driving mechanisms as are built up of parallel series of links fastened to each other and to the adjoining links by pins and bushings, or seat and rocker pins. The effect of constructions of this nature is to give exceptional articulating or bending ability to the entire chain, with very little wear

and noise, provided lubrication has been properly carried out. Due to the usual oil economy which is obtainable on certain chains of this nature, and the possibility of reduced lubrication, little or none of the lubricant will normally be thrown off by centrifugal force, even under the higher speeds which are often prevalent. Therefore cleanliness of operation is also an important factor, especially on overhead installations where the chains and sprockets are often exposed.

Although silent chain drives were originally designed for power transmission where neither belts nor meshed gears were practicable, they have completely outgrown this usage, and today are competing with belts and gears on all manner of service.

Rigidity in every installation is an important feature. Therefore, bearings must be securely anchored in order to prevent vibration of shafts or the possible shortening of the distance between centers. In making such an installation shafts and sprockets should be tested for levelness; measurements taken between shafts on each side of the sprockets in order to bring them directly parallel; and the sprockets lined up accurately by laying a straight edge across their sides. Alignment can be checked at any time after the chains have been in operation by noting the wear on individual links.

There are two distinct types of silent chains of which the link or joint connection device is the distinguishing feature.

In one case a pin or pin and bushings is used for this purpose, in the other a "rocker joint" serves this purpose by the use of a seat and rocker pin. In chains of both types the pins are securely held in place by washers, and by riveting over the ends of the seat pin or roller pin as the case may be, or else by



*Courtesy of The Whitney Mfg. Co.*

Fig. 7.—Silent type of chain equipped with center guide.



*Courtesy of The Whitney Mfg. Co.*

Fig. 8.—Silent Chain fitted with side guides. Note manner of fastening pins with cotter pins.



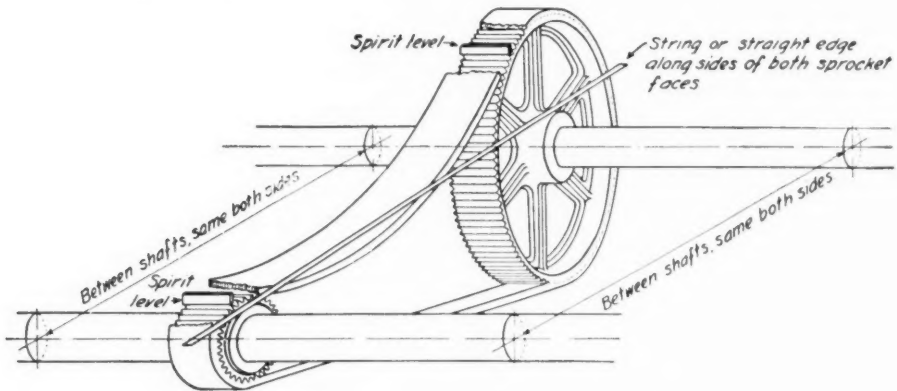
cotter pins. The chain proper consists of a number of parallel plates.

In chains of the roller joint type sliding friction takes place between the link pin and bushing. These bushings are generally constructed as segments, two being required per joint. By virtue of the uniformity of the bearing surfaces, wear occurs evenly between the pins and bushings. In operation, chains of this character fold into the sprocket teeth without jar, and each link fits perfectly with the corre-

wear between links and sprocket teeth is very slight, due to the uniform distribution of driving pressure and equalization of pressure throughout the chain.

### Factors Governing Chain Lubrication

In order to insure proper and efficient lubrication of driving chains, it is decidedly essential that operating conditions be studied. In fact, only by combining a knowledge of such factors as speed, load, clearances and extent of bend-



*Courtesy of Morse Chain Company*

Fig. 9.—Layout of a Silent Chain Installation showing manner of testing for alignment, levelness and parallel.

sponding tooth. In event of wear, radial adjustment is possible in order to compensate for any lengthening of pitch. Roller joint silent chains are retained in proper position on the sprockets and prevented from working off by the use of a center guide, or flanges on each side of the driving sprockets. Normally but little guiding is necessary, hence the wear on the sides of the guide is slight, especially as guiding takes place on the slack of the chain.

In rocker joint chains rolling friction occurs instead of sliding friction. This is attained by the elimination of the bushings and use of two pins, one known as the "seat pin" which is built with a plane surface, the other, termed the "rocker pin" which has a convex surface. By inserting these pins into the links as shown in Fig. 10 it is seen that a rocking or rolling effect is attained when bending takes place. When wear occurs sufficiently on the bearing surfaces of these pins to cause lengthening of the pitch, it is only necessary to renew one or both pins to correct this feature. As a rule

ing or articulation can proper lubrication be determined upon. For example, a fluid product that would be adaptable to silent chains might often be altogether too light to suit the clearances prevalent in a detachable or pintle chain.

The matter of speed is important, since it involves the frequency of shocks due to engagement of the chain links, and gear or sprocket teeth. In other words, the greater the speed the more frequent will be the shock on each link.

Whether or not shocks of this nature will be detrimental to lubrication will depend upon the load and constancy of operation. It is natural to expect that the rapid repetition of such shocks upon the bearing points of the chain will tend to force or squeeze the lubricating film out from between the rollers and bushings, or rocker bearing surfaces. It is not gen-



*Courtesy of Morse Chain Company*

Fig. 10.—Rocker Joint Type of Silent Chain. Seat and Rocker pins are clearly shown by arrows.

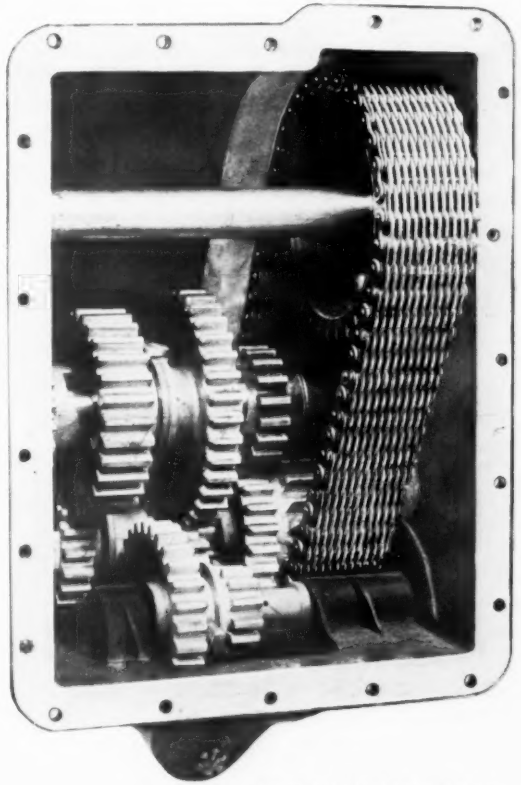
## LUBRICATION

erally possible to compensate for this condition by increasing the viscosity of the lubricant to any great extent, as is often done on heavily loaded bearings, due to the fact that the penetrative ability of the lubricant would thereby be markedly decreased. Capillary action or back suction will reduce the possibility of insufficient lubrication somewhat. It is customary to assume that the standard practice of reduction of load with increase of speed will sufficiently reduce link shock to not only keep within the required factor of safety, but as well to insure continuation of effective lubrication.

Sudden starting and stopping usually impose an abnormally severe shock upon a chain, especially where heavy loads are picked up. Lubrication, of course, is secondary to operating conditions of this nature. To some extent we can increase the viscosity within the limits of penetrative ability of the lubricant, but perhaps the more satisfactory procedure will be to lubricate more frequently.

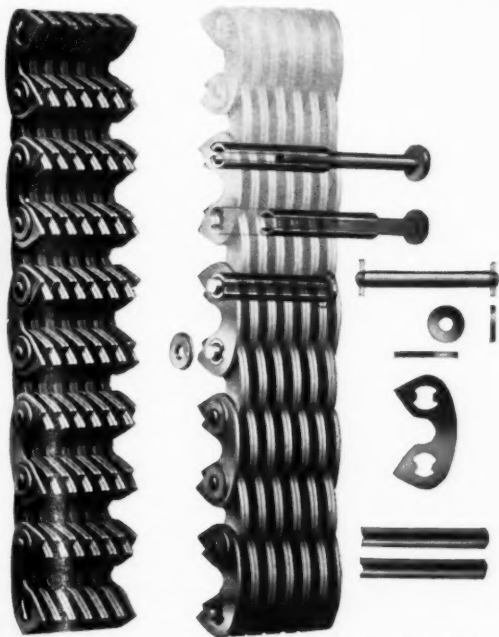
The extent of bending or articulation of a driving chain imposes wear not only on the link pin bearings, but as well at the points of contact between the chain and the gear or sprocket. In fact, this is the chief cause of

external wear, both of the chain and sprocket, notwithstanding that correct chain design endeavors to eliminate as far as possible this tendency towards friction and external wear, con-



*Courtesy of The Whitney Mfg. Co.*

Fig. 12.—Silent type of chain installed in a transmission case.



*Courtesy of Link-Belt Company*

Fig. 11. A Bushed Joint Silent Chain, showing in detail the various component parts and their assembly.

fining necessary rubbing or rolling to the joints. Therefore, pins, bushings, rollers, etc., are customarily built with adequate bearing surface to take up the usual strains. Still, a certain amount of external wear will be present at any event, and for this reason an adaptable chain lubricant should be capable of effectively serving both internal and external wearing points. Unfortunately, however, we are confronted with a situation where compromise is necessary.

Depending upon the existing clearances, the lubricant must have a certain amount of fluidity in order to be able to penetrate thoroughly throughout the entire link whether pins and bushings, rollers or rocker joints are involved. On the other hand, to adequately prevent external wear of teeth and chain a relatively,

heavy adhesive lubricant should be used, which will adequately resist the effects of centrifugal force and stick to the wearing surfaces. Such a lubricant, being regarded as semi-solid, is naturally too viscous to serve the internal bearings. Hence a compromise must be effected whereby sufficient viscosity reduction is obtained to meet one purpose, yet with the retention of adhesion as much as possible. Certain steam cylinder stocks, or reduced petroleum residuums have been proven to be the best bases for such a lubricant. They are, if necessary, blended to the desired viscosity with lighter, pure mineral products.

When chains must be operated in the presence of dust, dirt, chemical fumes or water, the responsibility that the lubricant must assume becomes all the greater. In such cases not only must it serve as a lubricant, but as well, as a protective agent for the bearing surfaces.

Grit, dust, acids and moisture will tend to promote wear and corrosion to a marked extent. Grit and dust in particular being of an extremely penetrative nature will always tend to work into clearance spaces and immediately increase the wear. Unless the lubricant is of the proper viscosity and base, it will often become incorporated with such foreign matter and develop into an abrasive paste similar to a valve grinding compound.

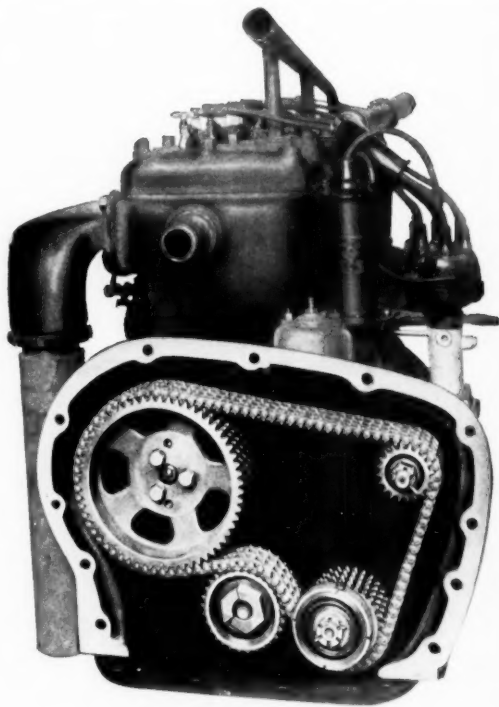
### Selection of Lubricants

The essential requirement of a chain lubricant is that it will adequately penetrate to the rollers, rockers or sliding surfaces of the links. It does no good to apply a lubricant to the surface of a chain if it has not the penetrative ability to reach all wearing parts by virtue of its viscosity and the clearance between the wearing surfaces.

The more simple designs of chains such as the detachable and pintle types, may or may not be subject to lubrication, according to the nature of their service. Wherever possible it will be advisable to endeavor to lubricate them, unless they actually operate in contact with an excess of foreign matter, when a lubricant would become more of a detriment than a benefit. For detachable and pintle chains a relatively heavy

lubricant of from 1,000" to 2,000" Saybolt viscosity at 210° F. will be suitable.

Roller chains are practically always subject to lubrication. Oftentimes little regard is given to them due to their seemingly rough construc-



*Courtesy of Link-Belt Company*

Fig. 13.—Installation of a Bushed Joint Silent Chain in an automobile engine.

tion, and waste oils are carelessly slopped on at intermittent intervals. Waste oils will lubricate, but due to the fact that they may often contain quite an appreciable amount of sludge and abrasive matter their application is not recommended. It is better to use a lubricant similar to that recommended heretofore for pintle and detachable chains or perhaps a lighter product if conditions warrant.

On chains of the above types it is customary to brush the lubricant uniformly over the wearing surfaces while they are operating slowly. It will be found advisable to heat the lubricant in order to facilitate the spreading of a thin, even coating.

Silent chains may be operated exposed, or in an oil-tight casing. The speed of operation



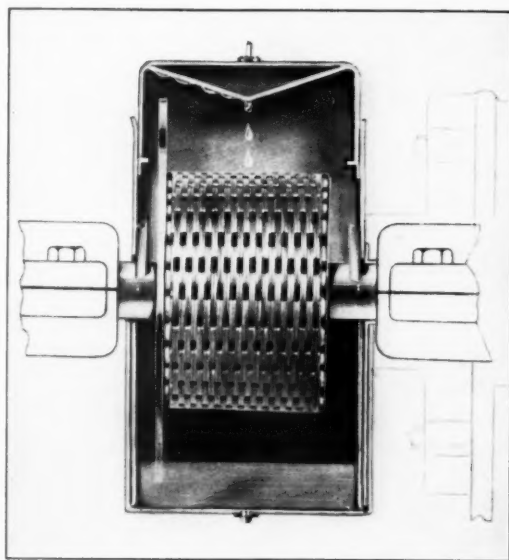
is oftentimes regarded as a guide as to whether a casing should be used. However, in service where dust, grit or other foreign matter is present a casing is always advisable whatever the speed. Naturally a chain which operates in a dust-proof, oil-tight casing which is equipped with some form of automatic lubricator, will require the least attention, and operate most efficiently. An effective type of casing chain-lubricator makes use of the principles of splash lubrication by means of a disc attached to one side of the main shaft. As the wheel rotates the disc dips into the oil in the base and throws it to the top of the casing which is built in the shape of a wedge. As a result there is a continuous and uniform dripping of oil upon the chain, as indicated in Fig. 14. In casings of this type the oil level is below the chain, the disc dipping in it to a depth of one-eighth of an inch or better.

Other types of casings depend upon bath lubrication, in which event the oil level should be somewhat above the lowest part of the chain.

Casings which are used on high speed chains are often equipped with an oil pump. Forced lubrication is thus attained and the oil sprayed continually upon the chain.

When silent chains are operated exposed, the lubricant must be applied either by brushing it uniformly over the driving surface, or by removal and immersion of the entire chain. Certain manufacturers of chains of this nature treat them with the lubricant before they leave the factory, in order to give them a good start in life. Usually a soaking bath is used, the chains being immersed for a sufficient length of time to allow penetration to all interior parts. Such a treatment will insure efficient lubrication over at least a month of normal operation. Subsequent soaking of the chain in the lubricant at periodic intervals is advisable wherever possible.

When it is impossible to remove a silent chain for such treatment, the bearing or driving surface should be brushed or otherwise treated with a light uniform coating of lubricant about once a week or more frequently if necessary. If this is done during slow operation, satisfactory penetration will occur to all the joints through the combined effects of bending and capillary action.



*Courtesy of Link-Belt Company*

Fig. 14.—Cross-section of an automatic lubricating Silent Chain casing. Note splash disc to the left of the chain.

Due to the fact that clearances in silent chains are usually very small, it is generally advisable to use a relatively fluid straight mineral lubricant. When chains are encased, if they are to be bath lubricated, an engine oil having a viscosity of about 500" Saybolt at 100° F. will be suitable. Where exposed, or encased but not submerged in oil, a heavier lubricant such as a mineral cylinder oil or light gear compound should be used. Considerable difference of opinion often arises as to the use of greases or other semi-solid products. In many cases these would serve the purpose admirably, especially on such chains as have sufficient clearance to enable proper penetration. Still it can be appreciated that the lubricant must have a certain ability to flow, and we can not always depend entirely upon capillary action to bring about suitable penetration to the pins, bushing or rockers, etc.

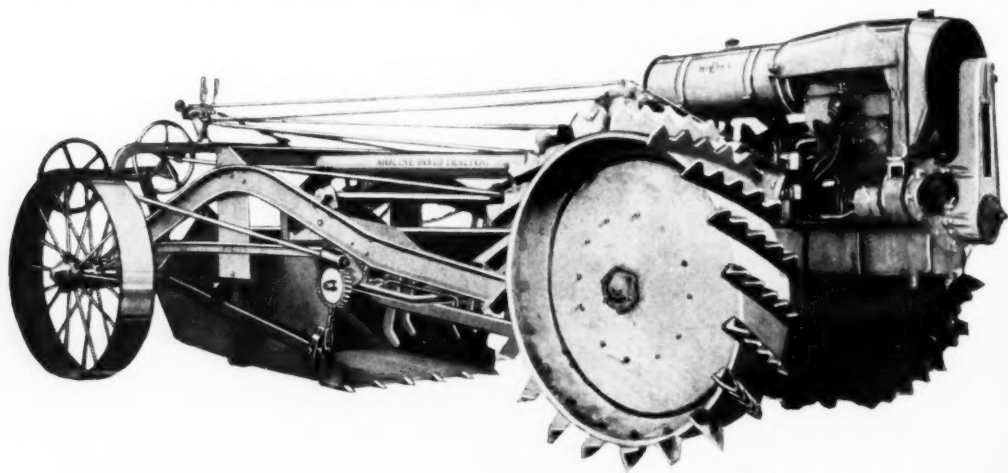
In conclusion it is well to remember that chains and casings will often require cleaning especially if operating conditions are not of the best, or entry of dust or dirt occurs. In such cases a kerosene or gasoline wash will be found satisfactory. Chains should be removed if possible and immersed in this wash. Cases should be drained and rinsed out to insure the removal of all sediment that may have collected.

# Lubrication of Road Building Machinery

**M**ODERN highway construction has developed remarkably during the past few years and much of the crude, make-shift equipment formerly used for this purpose, such as the split-log drag, etc., that many of us remember, has given way entirely to scientifically constructed road building machinery. The demands of the motorist have been heavy, and to meet them the construction of our network of national, state and municipal highways has taxed the science of the civil

## The Scarifier and Grader

Preparation of any roadbed will naturally depend in extent upon the nature of the soil, whether the road is to be built in virgin territory or over a course that is already subject to traffic, how heavy future traffic may become, and the type of foundation and surface that is to be used. In general, the preparation of a roadbed will include some form of scarification in order to loosen the hard earth or to smoothen a relatively rough subgrade. In the past a plow team



*Courtesy of Moline Plow Company, Inc.*

Fig. 15.—Power driven Road Tractor equipped with a scarifier as well as a power lift scraper.

engineer and the resources of the contractor. But the modern concrete mixer, road scraper, grader, steam roller and machine paver, etc., have effectively solved the problem.

Road building is essentially a materials handling proposition. From the preliminary grading to the application of the surface, we have to deal with the transference of earth, the handling and placing of the foundation and the spreading of the surface material, be it concrete, asphalt, or simply a coating of crushed stone or gravel. With the exception of the power driven roller and concrete road surfacer, road building machinery such as graders, scarifiers and scrapers may be either self-propelling or designed to be drawn by horse power or tractors.

was generally used for this purpose, and the lay of the land was customarily followed, the roadbed being subsequently harrowed and so forth prior to laying of the foundation material. Today, however, the modern scarifier and grader (in conjunction with the power shovel, and drilling and blasting where necessary, serves practically the same purpose, eliminating hills whenever requisite with a decided economy of time and labor. Due to the fact that such machines are subject to exceedingly rough service and strain they are built according to exacting specifications. It is particularly important that all bearings and gears be built of the best materials and carefully aligned in order to insure a basis for efficient lubrication. The failure of a scarifier or grader due to burned

out bearings or other defects caused by faulty lubrication will oftentimes delay the entire job, inasmuch as frequently the concrete mixer, road roller and surfacer follow up closely.

The simplest form of road scarifier, grader or scraper is built as a draw-bar machine, and it is readily adaptable either to horse or tractor power. The gasoline or kerosene tractor is coming more and more into use for this service, however, on account of its economy and the increase in production that is available. Due to this development, many builders of such machines are producing a self-propelled device which embodies not only a convertible scarifier-grader, but oftentimes a road roller as well.

As would be expected, the most important details on a scarifier or grader are the lifting and lowering devices which control the blades or teeth. The lifting arms on certain draw-bar machines are therefore equipped with roller bearings in order to reduce friction as much as possible.

Some builders of convertible road machinery of the roller-scarifier type equip their products with air compressors, and operate the scarifying rig by air pressure. In general two cylinders are installed per machine for the distribution of pressure to the teeth. As

a result, power application is evenly distributed and the teeth forced rigidly into the roadway at a constant depth. On the other hand, pressure can be evenly released in event of obstructions being encountered. Steam pressure can also be used for manipulation of the scarifier by installing a pair of steam cylinders adjacent to the rear axle. The pistons of these cylinders are so connected to the scarifier bar that simultaneous admission of steam to either end of the cylinders serves to operate the pistons in concord and raise or lower the bar accordingly.

### Road Rollers

As great a factor as any in the building of a good highway is the road roller. Unless there is sufficient weight to adequately press the materials into place, and a power plant capable of operating the roller, regardless of the grade or other conditions, the roadway will suffer accordingly. Therefore the power plant is the controlling feature in the roller. Steam, gasoline and kerosene engines are all used in road rollers today, according to conditions that must be met.

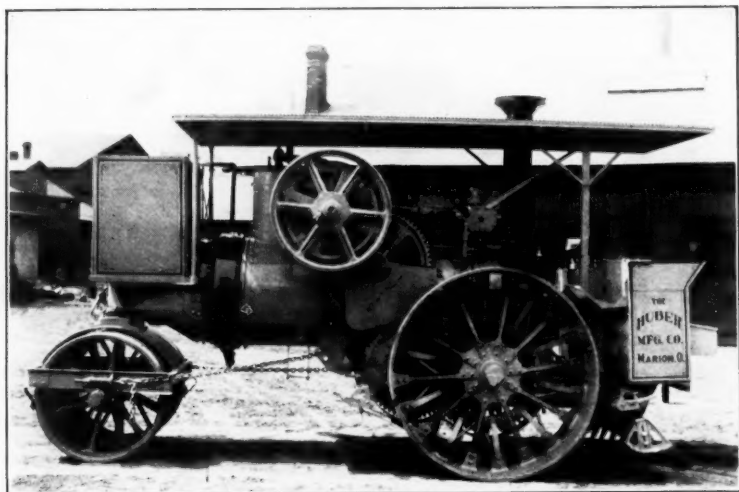
The steam roller is the most familiar. This machine is built very much along the same lines as the steam traction engine which was discussed in LUBRICATION for July, 1923. The boiler is generally of the locomotive or return flue type, operating usually at about 150 lbs. steam pressure. In order to insure as dry steam as possible whatever the character of the feed water or grade of operation, and to guard against the effects of priming or foaming, a suitable steam dome is generally installed. The engine on the steam roller is mounted on top of the boiler, and consists of one or two cylinders equipped with plain slide or piston type valves. In order to effect perfect control, power steering is becoming essential on the steam roller.

Gasoline and kerosene engine rollers are built with heavy duty engines, of one, two or four cylinders. Where scarifiers are attached to rollers of this nature, they are manipulated by air pressure, the machine being equipped with an air compressor which is operated by the engine, and a suitable receiver tank.



*Courtesy of Acme Road Machinery Co., Inc.*

Fig. 16.—Road Roller equipped with air-controlled scarifier. Note the two cylinders for even distribution of air pressure.



*Courtesy of The Huber Mfg. Company*

Fig. 17.—Steam Driven Road Roller equipped with a steam controlled scarifying device.

### Road Surfacing and Finishing Machinery

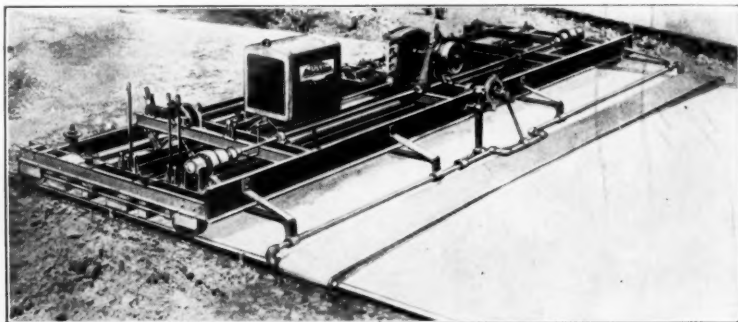
Concrete highway construction requires the use of a surfacing tamping and finishing machine which will thoroughly pack the material and form it to any desired crown or width. For this purpose a pressure beam device which travels along the side-forms is usually employed. Machines of this nature travel ahead at a rate of about five feet per minute. Two beams or tamping members are installed on machines of this type. The leading beam serves as a rough tamper, forcing the material ahead of it and into a compact bed by downward pressure. The follow-up or smoothing beam kneads the mass into the desired form and contact by a reciprocating or sawing action across the roadway. On a concrete surface this action effec-

tively works water globules and air up from the material. On some machines of this type the smoothing beam finishes the surface, on others a finishing belt is used to remove excess water.

The tamping members are operated by a gasoline or kerosene engine mounted on the machine, power being transmitted through suitable gearing. Reciprocating motion is attained by link and rocker mechanisms.

### Miscellaneous Other Equipment

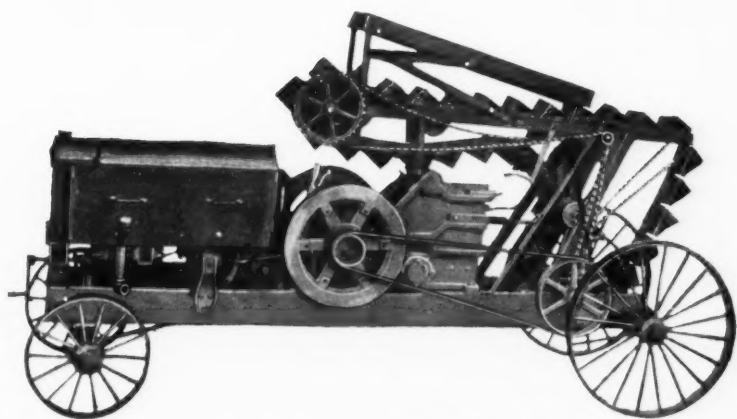
Portable stone crushers, power shovels, drilling and blasting equipment, concrete mixers, asphalt heating tanks and surface heaters, etc., are often employed in highway construction where specific requirements necessitate their usage. Concrete mixers and power shovels



*Courtesy of Austin Machinery Corporation*

Fig. 18.—Concrete Road Tamper and Finisher, which thoroughly packs the concrete and trowels the surface as desired.

## LUBRICATION



*Courtesy of Aeneas Road Machinery Co., Inc.*

Fig. 19—Portable Stone Crusher equipped with elevator. This machine is self-propelled, being fitted with a 4-cylinder gas engine.

have been discussed in LUBRICATION for June, 1923. Portable crushers embody the principle of jaw crushing and are usually equipped with a gasoline engine and a bucket conveying device. The conveyor is operated by belt drive from the crusher mechanism. Crushers of this nature are valuable in utilizing roadside rock piles and producing the necessary aggregate at low cost.

### Lubrication

Road building machinery in general involves steam cylinders, gearing, plain bearings, roller bearings, air compressors, and gasoline or kerosene engines. Therefore lubrication of such mechanisms is treated in this order.

#### Steam Cylinders

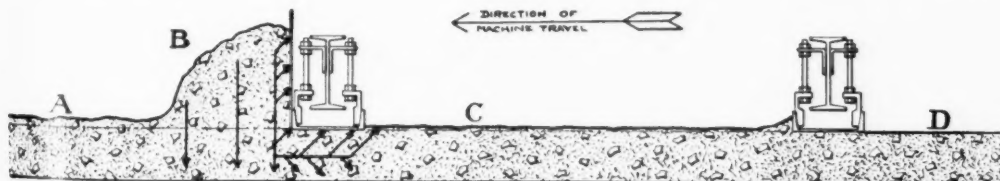
Due to the fact that steam cylinder lubrication on other equipment similar to the steam roller, such as the steam traction engine, and power shovel, etc., has been discussed extensively in recent issues of LUBRICATION,\* the reader is referred to these previous articles.

\* June and July, 1923.

Operating conditions are essentially similar, and the machines are subject to identical difficulties, such as the possibility of priming, foaming, insufficient atomization of the cylinder oil, and having to use impure water. For this reason a lubricant must be used which will contain sufficient fixed oil, or animal oil compound, to insure the formation of an extremely tenacious film of emulsified lubricant on the cylinder walls and valve seat. Only thereby will the washing action of water be counteracted. The base of the cylinder oil should therefore be a medium viscosity, highly adhesive, steam refined cylinder stock. A viscosity of about 130" Saybolt at 210° F. has been proven satisfactory.

#### Gearing and Chains

Dependent upon the type and design of the machine, gears may operate either enclosed or exposed. On the steam roller and scarifier-graders exposed conditions will often prevail. On the road surfacing machine gears are enclosed in a casing. It is difficult to make any



*Courtesy of A. W. French & Co.*

Fig. 20.—Details of the principles of operation of a concrete road surfacer. (A.) Fresh Concrete. (B.) Concrete piled in front of machine during its advance. (C.) Semi-finished surface. (D.) Finished surface crowned as desired.



more definite statements due to the fact that various builders follow both principles extensively. We can, however, state that in the operation of all such machinery there will be considerable dust and dirt present. Much of this will adhere to exposed gearing. It is customary to use a relatively light gear compound for such service, that will be sufficiently adhesive to stick to the wearing surfaces and not drip too much, capable of being painted on with a brush, and still not so viscous as to become unduly incorporated or balled up with dirt and ultimately bring about excessive wear on the teeth. For this purpose a gear compound having a viscosity of about 200" Saybolt at 210° F. will be advisable.

Where chains require lubrication the above gear compound can be satisfactorily used. Frequently, heating will insure penetration to rollers and other wearing parts.

#### *Bearing Lubrication*

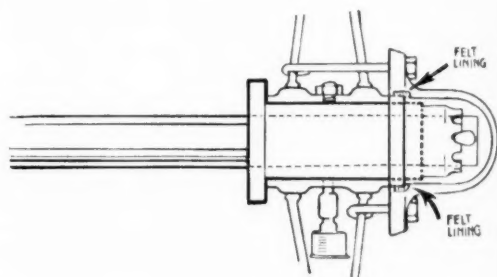
While plain babbitted bearings are most frequently employed on road building machinery, roller and ball bearings are installed on certain parts, such as wheel axles, etc. Anti-friction bearings of this type on graders and scarifiers decrease power consumption and are claimed to enable greater evenness of cuts, etc. For roller and ball bearings enclosed in tight casings a lubricant of the nature of petrolatum or a good grade of liquid grease is best suited. The essential character of such a lubricant is that it must be free from acid or alkali.

Babbitted bearings involve no lubricating difficulties beyond the possibility of entry of dust and dirt. For this reason sight feed oil cups, compression grease cups, capped oil holes, or some form of patented pressure lubricating system, is usually called for by the builders. Grease lubrication is preferred, due to the inaccessibility of many of the bearings and the lack of attention that will usually be prevalent. For this purpose a medium or heavy grade of cup grease should be used. When provision is made for oil, a heavy grade of straight mineral engine oil such as would be used for external lubrication of the steam roller engine or tractor

will be suitable, the viscosity being in the neighborhood of 500" Saybolt, at 100° F.

#### *Air Cylinders and Compressors*

Air cylinders, pumps or compressors with which certain types of roller-scarifiers are equipped will require the use of a lighter, higher grade lubricant than that used for general bearing lubrication. We have essentially the same problems to deal with here as are involved in general air compressor lubrication, i.e., carbon deposits, and valve fouling. As a result the lubricant must be selected for its low carbon content. A filtered straight mineral oil having a viscosity of from 200" to 300" Saybolt at



*Courtesy of Stockland Road Machinery Co.*

Fig. 21.—Details of a dust-proof hub cap, as installed on certain types of road machinery.

100° F. has been found most desirable. The external lubrication of such equipment can be taken care of with the 500" viscosity engine oil recommended for general bearing service.

#### *Gasoline and Kerosene Engines*

Where internal combustion engines of the above type are installed, selection of the proper lubricant should be made in cooperation with the builders or a reputable oil company. The several systems of lubricating such engines, and the numerous other variable conditions, such as piston clearances, load, and prevalent climatic temperature, etc., must all be considered. The requirements are essentially the same as for the modern automobile or tractor engine, and lubrication should be regarded as equally important. In selecting the proper lubricant special attention should be given to its carbon forming tendency and its pour test if cold weather is to be encountered.